REMARKS

In view of the following discussion, the Applicant submits that none of the claims now pending in the application is anticipated under the provisions of 35 U.S.C. § 102. Thus, the Applicant believes that all of these claims are now in allowable form.

I. REJECTION OF CLAIMS 1-17, 21-23, 27, AND 28 UNDER 35 U.S.C. § 102

The Examiner has rejected claims 1-17, 21-23, 27, and 28 in the Office Action under 35 U.S.C. § 102 as being anticipated by the Heiskala patent (US Patent 6,298,035, issued October 2, 2001, herein referred to as Heiskala). The Applicant respectfully traverses the rejection.

Heiskala discloses a method and apparatus for estimating separate channel frequency responses for two channels in an orthogonal frequency division multiplexing system with two transmitters. More specifically, "the channel frequency responses are estimated using specifically selected training symbols that are broadcast from the two transmitters. The training symbols are specifically selected so as to improve the estimation of the channel frequency responses for each channel, while requiring the same amount of training symbols as in an estimation of the channel frequency response of a single channel." (See Heiskala, Abstract)

The Examiner's attention is directed to the fact that Heiskala fails to teach or to suggest a method or apparatus for communicating, where a cross-correlation estimate between the first set of training symbols and at least one set of second training symbols is essentially zero, as positively claimed by the Applicant. Specifically, the Applicant's independent claims 1, 10, 21, and 27 positively recite:

> 1. A method for communicating, comprising:
> transmitting a set of first training symbols using a first communication channel; and
> transmitting one or more sets of second training symbols using one or more second communication channels;
> wherein the one or more second sets of training symbols are based on the set of first training symbols and a cross-correlation estimate between the first set of training symbols and at least one of the sets of second training symbols is essentially zero, whereby a channel estimation is achieved without performing a matrix inversion. (Emphasis added)
>
> 10. A method of communicating, comprising:
> receiving a set of first training symbols;
> receiving one or more sets of second training symbols; and

characterizing two or more communication channels based on the set of first training symbols and the one or more second sets of training symbols;

wherein a cross-correlation estimate between the set of first training symbols and at least one of the sets of second training symbols is essentially zero, whereby a channel estimation is achieved without performing a matrix inversion. (Emphasis added)

21. An apparatus for communicating, comprising:

a first transmit device that transmits a set of first training symbols; and

a second transmit device that transmits a set of second training symbols;

wherein a cross-correlation estimate between the set of first training symbols and the set of second training symbols is essentially zero, whereby a channel estimation is achieved without performing a matrix inversion. (Emphasis added)

27. An apparatus for communicating, comprising:

a receive device that receives at least a set of first training symbols transmitted by a first transmit device and a set of second training symbols transmitted by a second transmit device; and

an estimator that estimates at least a first channel related to the first transmit device based on at least the set of first training symbols;

wherein a cross-correlation estimate between the set of first training symbols and the set of second training symbols is essentially zero, whereby a channel estimation is achieved without performing a matrix inversion;

wherein the estimator further estimates the first channel based on at least the set of second training symbols;

wherein the estimator estimates the first channel without using a matrix inversion;

wherein the set of second training symbols is substantially identical to the set of first training symbols with a phase shift. (Emphasis added)

The Applicant's invention provides a method and apparatus for communicating via wireless systems. In one embodiment, the present invention involves the transmission of training symbols using a plurality of channels, wherein the cross-correlation estimate between a first set of training symbols and at least a second set of training symbols is essentially zero. The present invention utilizes matrix theory and mathematics to determine the cross-correlation energy between two sets of training symbols (i.e., a cross-correlation estimate). When the cross-correlation between the sets of training symbols is essentially zero, channel estimation can be achieved without a matrix inversion. This effectively simplifies the method of determining the channel estimation.

Rather, Heiskala fails to mention or even suggest cross-correlation in any regard. The Examiner alleges that Heiskala (specifically, column 7, lines 45-48) teaches "a cross-correlation estimate between the first set of training symbols and at least one of the sets of second training symbols is essentially zero." The Applicant respectfully disagrees. Notably, column 7, lines 42-48 of Heiskala specifically reads:

> "One drawback with this solution is, if H1=H2, as in the additive White Gaussian Noise (AWGN) channel, the received signal during A2 and B2 is equal to A1-A1=0, so nothing is received. To remove this effect, the symbol pairs (A1,B1) and (A2,B2) should be orthogonal. In this case, they will not cancel each other, if the channels H1 and H2 happen to be equal."

In this paragraph, Heiskala suggests that the symbol pairs should be orthogonal in order to avoid a unique scenario where the two channels, H1 and H2, are equal. This section, as well as Heiskala as whole, fails to disclose the limitation of a cross-correlation estimate between two sets of training symbols is essentially zero. Furthermore, the Applicant respectfully submits that the fact that symbol pairs should be orthogonal, as disclosed in the cited section above, is not commensurate to the cross-correlation estimate between (at least) two sets of training symbols being essentially zero. Thus, Applicant's independent claims 1, 10, 21, and 27 are not anticipated by the teaching of Heiskala.

Responsive to the Examiner's assertion in paragraph 3 of the Final Office Action, it appears that the Examiner is indicating that a clarification of the claim may overcome the Heiskala reference. Although Applicant believes that Heiskala fails to anticipate Applicant's invention as presently claimed, Applicant has amended the independent claims to recite the clarification to address the Examiner's concern.

Since claims 2-9, 11-17, 22-23 and 28 depend, either directly or indirectly, from independent claims 1, 10, 21, and 27 and recite additional features thereof, the Applicant submits that claims 2-9, 11-17, 22-23 and 28 are also not anticipated by the teachings of Heiskala. Therefore, the Applicant submits that claims 2-9, 11-17, 22-23 and 28 also fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder.

CONCLUSION

Thus, the Applicant submits that claims 1-17, 21-23, and 27-28 now fully satisfy the requirements of 35 U.S.C. § 102. Consequently, the Applicant believes that these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly requested.

If, however, the Examiner believes that there are any unresolved issues requiring the issuance of an allowance in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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